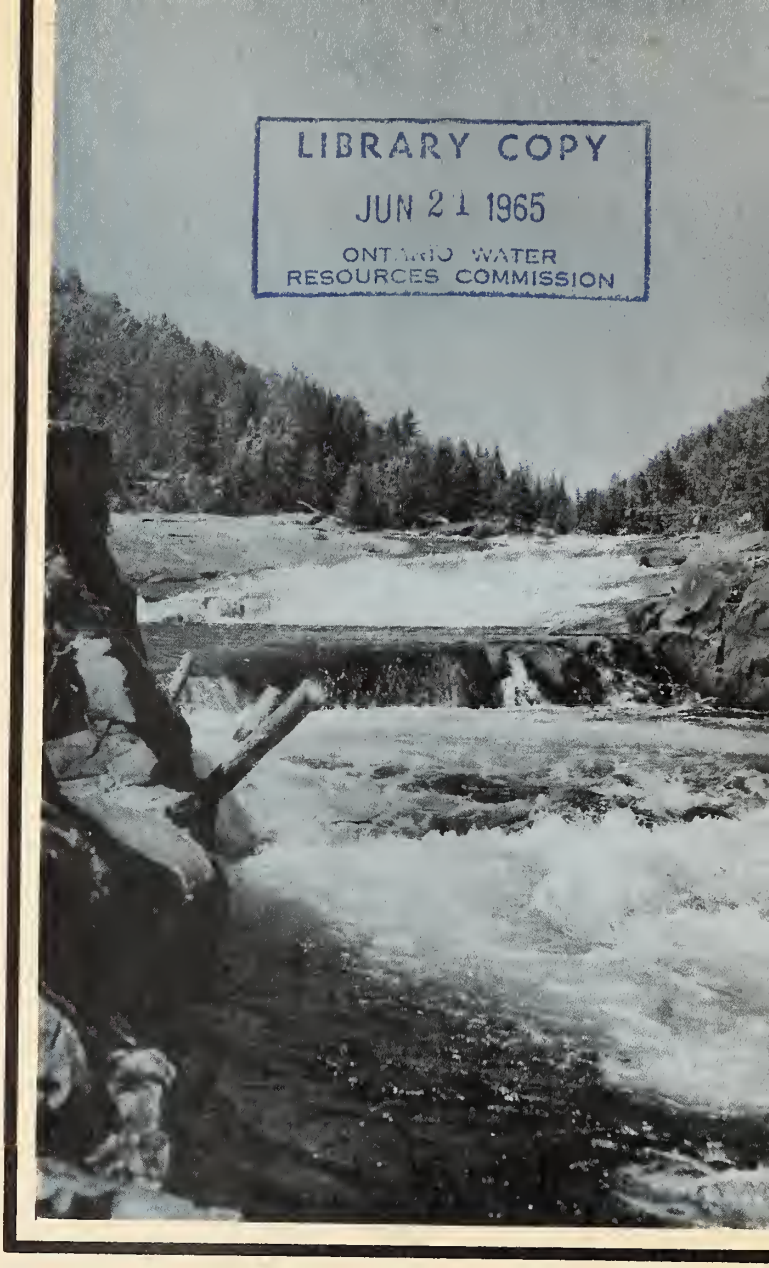
ONTARIO MINISTRY OF ENVIRONMENT
3693600002446 8

Preston Sewage Treatment Plant



LIBRARY COPY
JUN 21 1965
ONTARIO WATER
RESOURCES COMMISSION

1963 Annual Report

TD
367
.A56
P748
1963
MOE

Ontario Water Resources Commission

TD
367
.A56
P748
1963

Preston : sewage treatment plant.
81799

ONTARIO WATER RESOURCES COMMISSION

OFFICE OF THE GENERAL MANAGER

Mayor and Members of Council,
Town of Preston.

Gentlemen:

I am pleased to submit, for your information, the 1963 Annual Operating Report of the Preston Sewage Treatment Plant, OWRC Project No. 59-S-46, which has been prepared by our Division of Plant Operations.

We are grateful for the kind cooperation which you and your staff have extended to our Operations staff throughout the year. We look forward to a continuing close association with you in our mutual endeavour to control pollution.

Digitized by the Internet Archive
in 2015

https://archive.org/details/prestonsewagetre24468

General Manager,
Ontario Water Resources Commission.

Dear Sir:

It is with pleasure that I present to you the Annual Report of the operation of the Preston Sewage Treatment Plant, OWRC Project No. 59-S-46 for 1963.

This report presents design data, outlines operating problems encountered and summarizes in tables, charts and graphs all significant flow and cost data.

Yours very truly,

B. C. Palmer,
Director,
Division of Plant Operations.

foreword

This report is designed to present the highlights of the operation of these works during 1963. Trends in flows and other operating data can be extremely useful in the development of necessary long range enlargement and improvement programs.

In addition to the activities reported herein, much unrecorded effort has contributed to the success of this operation. The municipality, through representatives on the Local Advisory Committee, has given valuable assistance in reviewing salary schedules, detailed operating budgets, personnel problems, flow patterns, and major maintenance problems.

The Division of Plant Operations has provided direction to the field staff in administrative procedures, quality control, maintenance schedules, equipment inspection and purchase supervision. A number of other Divisions of the Commission have been of service. The Division of Construction has offered helpful advice on equipment selection and renovation problems. The Division of Sanitary Engineering has maintained, through its District Engineering staff, a keen interest in the operation and has made a number of constructive recommendations. Its operator training courses have been very helpful. The Division of Finance has processed many payrolls, purchase orders and invoices dealing directly with this project. The Commission Personnel Director has been most helpful in the selection of new staff.

The excellent cooperation of all of these groups is gratefully acknowledged.

B. C. Palmer,
Director,
Division of Plant Operations

DIVISION OF PLANT OPERATIONS

contents

Foreword..... Page 1

Title page ..... Page 2

History..... Page 3

Project Staff..... Page 4

Description of Project..... Page 5

Design Data..... Page 7

Plant Flow Chart..... Page 9

Process Data..... Page 10

Operating Costs..... Page 20

Summary..... Page 23

Total Costs.....Inside back cover

C. W. Perry
Assistant Director
D. McTavish
Regional Supervisor
B. G. Porter
Operations Engineer

PRESTON SEWAGE TREATMENT PLANT

OPERATED FOR

THE TOWN OF PRESTON

BY

THE ONTARIO WATER RESOURCES COMMISSION

CHAIRMAN

A. M. Snider

COMMISSIONERS

W. D. Conklin, Q. C.

J. H. H. Root, M. P. P.

J. A. Vance, LL. D.,

A. A. Wishart, Q. C., M. P. P.

GENERAL MANAGER

D. S. Caverly

ASSISTANT GENERAL MANAGERS

G. M. Galimbert

L. E. Owers

COMMISSION SECRETARY

W. S. MacDonnell

1960 to 1963 History

INCEPTION

The Town of Preston and the Ontario Water Resources Commission initiated plans for the construction of a modern sewage treatment plant.

The firm of Proctor and Redfern, Toronto, Ontario, Consulting Engineers, was engaged to prepare plans and specifications for the project.

APPROVAL

In November 1961, the Town signed an agreement with the Ontario Water Resources Commission to finance, construct and operate the project.

CONSTRUCTION

Louis Donolo Construction Limited began construction in December of 1961. The Division of Plant Operations commenced operation of the project in February 1963.

TOTAL COST

Total capital cost of the project was $620,000.00.

E. Simpson
Chief Operator

OPERATORS:

J. Greens
L. Sage.

The normal complement of staff consists of one Chief Operator and two Operators. During the week, Monday to Friday, the plant is staffed eight hours per day. Staff rotation provides four hours coverage per day on Saturday and Sunday.

Mr. Simpson received his Certificate of Qualification as a Sewage Works Operator in 1963, after successfully completing a series of three, one week duration, courses of instruction sponsored by the Ontario Water Resources Commission. Mr. Sage is currently enrolled in the course and successfully completed the first series of lectures in 1963.

Description of Project

INFLUENT WORKS

The flow enters the plant through two 24 inch diameter sewers which empty into a 36 inch diameter sewer. After passing through a coarse bar screen the flow passes to the grit removal unit (detritor). Here the flow is maintained at one foot per second so that the heavy grit will settle out and the lighter solids will remain in the sewage. The grit is collected from the detritor by a mechanical rake. The collected grit is hauled out of the plant with the filtered sludge. The flow continues through a barminutor which cuts the large material. This may be by-passed through a manually cleaned bar screen. Both units, are 36 inches in width.

PRIMARY CLARIFIERS

The flow then enters two circular primary clarifiers. Here the sewage is stored for 3.3 hours, at design flow, and the heavy solids are allowed to settle to the bottom. Each clarifier is equipped with circular sludge scrapers and skimmers, which direct sludge and scum into hoppers. The sludge is then pumped to the sludge holding tank or the coil filter, while the primary effluent flows to the low lift wet well, where it is pumped to the aeration section.

AERATION SECTION

In the aeration section, primary effluent is mixed with the return activated sludge and aerated by means of mechanical aerating devices, which thoroughly mix the tank contents. There are two single pass aeration tanks which retain the flow for 9.2 hours at design flow.

FINAL CLARIFIERS

The flow then passes to the final settling tanks. Here the mixed liquor separates into rapid settling sludge and clear effluent. The effluent is directed to the chlorine contact chamber and the sludge is pumped back to the plant, either to the aeration section as return activated sludge, where it is again used in the process, or to the primary clarifier where it settles with the raw sludge. The retention time in the final clarifier is 3.0 hours at design flow.

CHLORINE CONTACT CHAMBER

The chlorine is applied to the effluent, prior to discharge to the river, in the chlorine contact chamber effluent is retained in the chlorine contact chamber for 15 minutes to ensure destruction of pathogenic bacteria. The effluent then flows into the Grand River.

VACUUM FILTER

The sludge that is removed from the sewage is pumped either directly to the vacuum filter or to the sludge holding tank and then to the filter. The filter media is coiled stainless steel springs. The drum is placed under vacuum and moisture is withdrawn from the sludge. Appurtenances included with the filter are a vacuum pump, filtrate receivers. lime and ferric chloride tank, mixing tanks and sludge pump.

In order to ensure rapid efficient filtering, the sludge is generally mixed with lime and ferric chloride. This coagulates the sludge and the filtering is greatly improved. The filtrate (liquid portion) is returned to the process.

Design–Data

GENERAL

Type of Plant - Activated sludge Mechanical Aeration

Design Population - 15,000

Design Plant Flow - 1.8 MGD

Per Capita Flow - 120 GPD

Five Day BOD -

Raw Sewage	-	300 ppm
Removal	-	95%

Suspended Solids -

Raw Sewage	-	350 ppm
Removal	-	90%

PRIMARY TREATMENT

Dorr-Oliver Long detritor, mechanical grit collector, rake washer and organic return.

Screening

Barminutor Model "C"
Manufactured by Chicago Pump Company Limited.

PRIMARY CLARIFIERS

2 concrete 50 ft. diameter - 10 ft. deep
Volume - 246,000 gallons
Retention time - 3.3 hours
Surface settling - 460 gal/ft./day
Weir overflow - 5,730 gal/ft./day
Mechanism by Dorr-Oliver Long

SEWAGE LIFT PUMPS

2 - 1800 gpm Worthington mixed flow pumps.

SECONDARY TREATMENT

Aeration Section

2 concrete tanks, each with 5 Ames Crosta Mills aerators.
Dimensions - 150' x 30' x 13'
Volume - 731,000 gallons
Retention Time - 9.7 hours at design flow.

FINAL SETTLING TANKS

2 - concrete, similar to primary tanks
Mechanism by Dorr-Oliver Long.

CHLORINE CONTACT CHAMBER

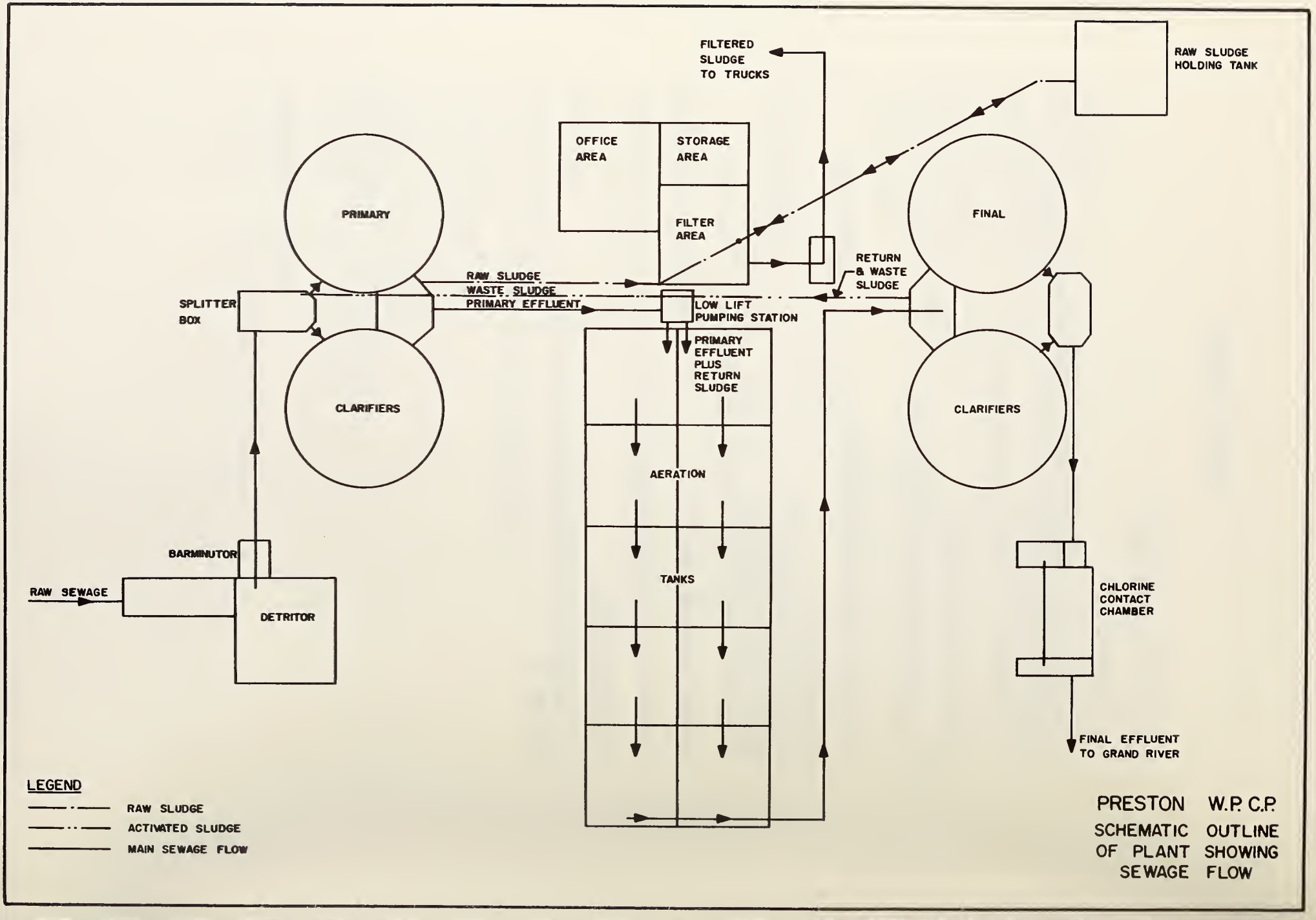
1 concrete tank.
Dimensions - 30' x 15' x 6'8
Volume - 18,700 gallons
Retention time - 15 minutes
400 lb/day Chlorinator by Fischer and Porter

SLUDGE HOLDING TANKS

1 concrete 20' x 20' x 11 feet deep

VACUUM FILTER

1 10 feet diameter Komline Sanderson Coil Filter
250 sq. ft.


FILTERED SLUDGE TO TRUCKS
RAW SLUDGE HOLDING TANK
OFFICE AREA
STORAGE AREA
FILTER AREA
PRIMARY
FINAL
RETURN & WASTE SLUDGE
RAW SLUDGE
WASTE SLUDGE
PRIMARY EFFLUENT
SPLITTER BOX
LOW LIFT PUMPING STATION
PRIMARY EFFLUENT PLUS RETURN SLUDGE
CLARIFIERS
CLARIFIERS
AERATION
TANKS
BARMINUTOR
RAW SEWAGE
DETRITOR
CHLORINE CONTACT CHAMBER
FINAL EFFLUENT TO GRAND RIVER
LEGEND
RAW SLUDGE
ACTIVATED SLUDGE
MAIN SEWAGE FLOW
PRESTON W.P.C.P.
SCHEMATIC OUTLINE OF PLANT SHOWING SEWAGE FLOW

Process Data

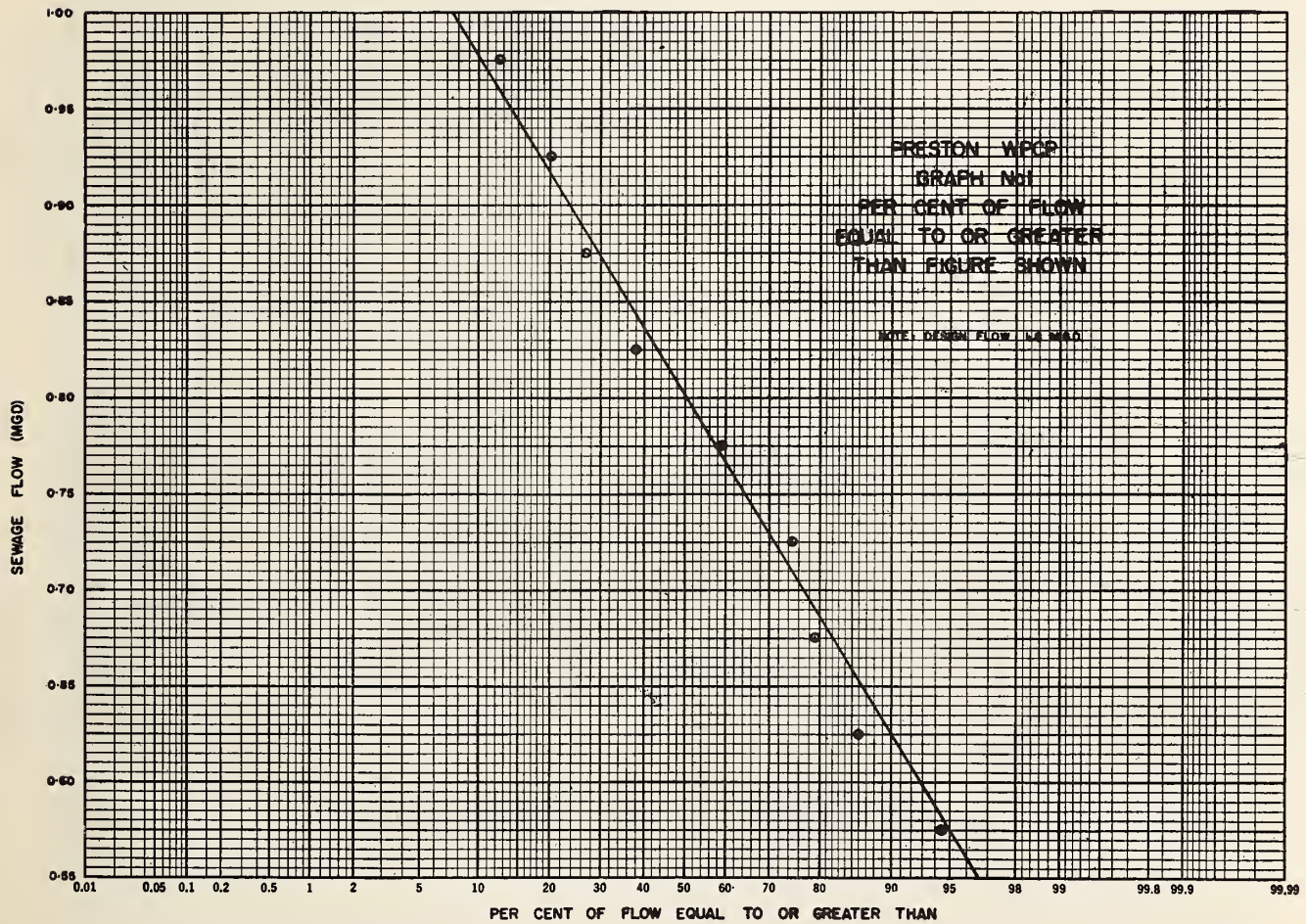
It may be seen from graphs No. 1 and No. 2 that the average flow was 0.80 million gallons per day and the maximum average daily flow for a month was just over 1.0 million gallons.

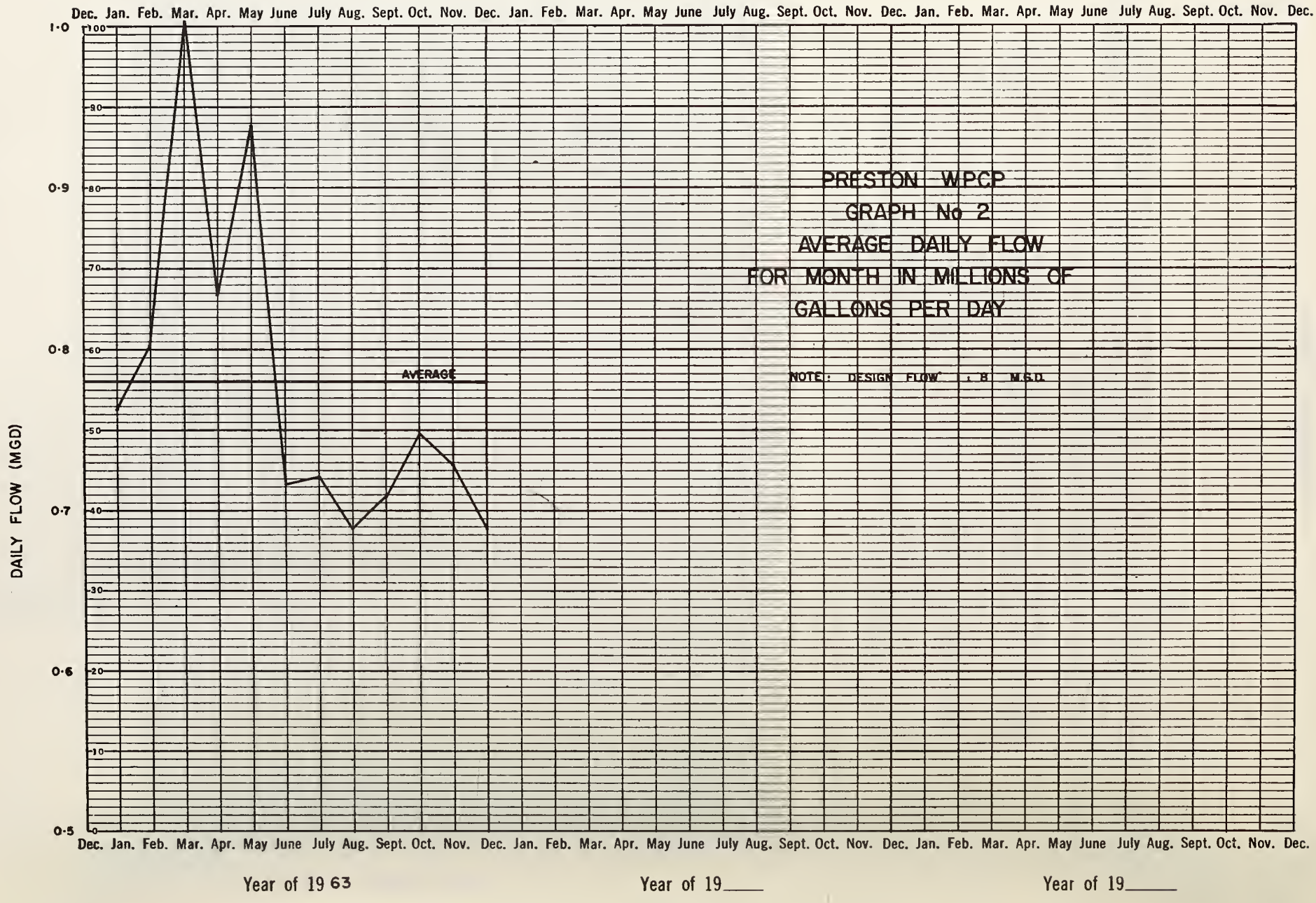
Graphs No. 3, 4 and 5 show the following points:

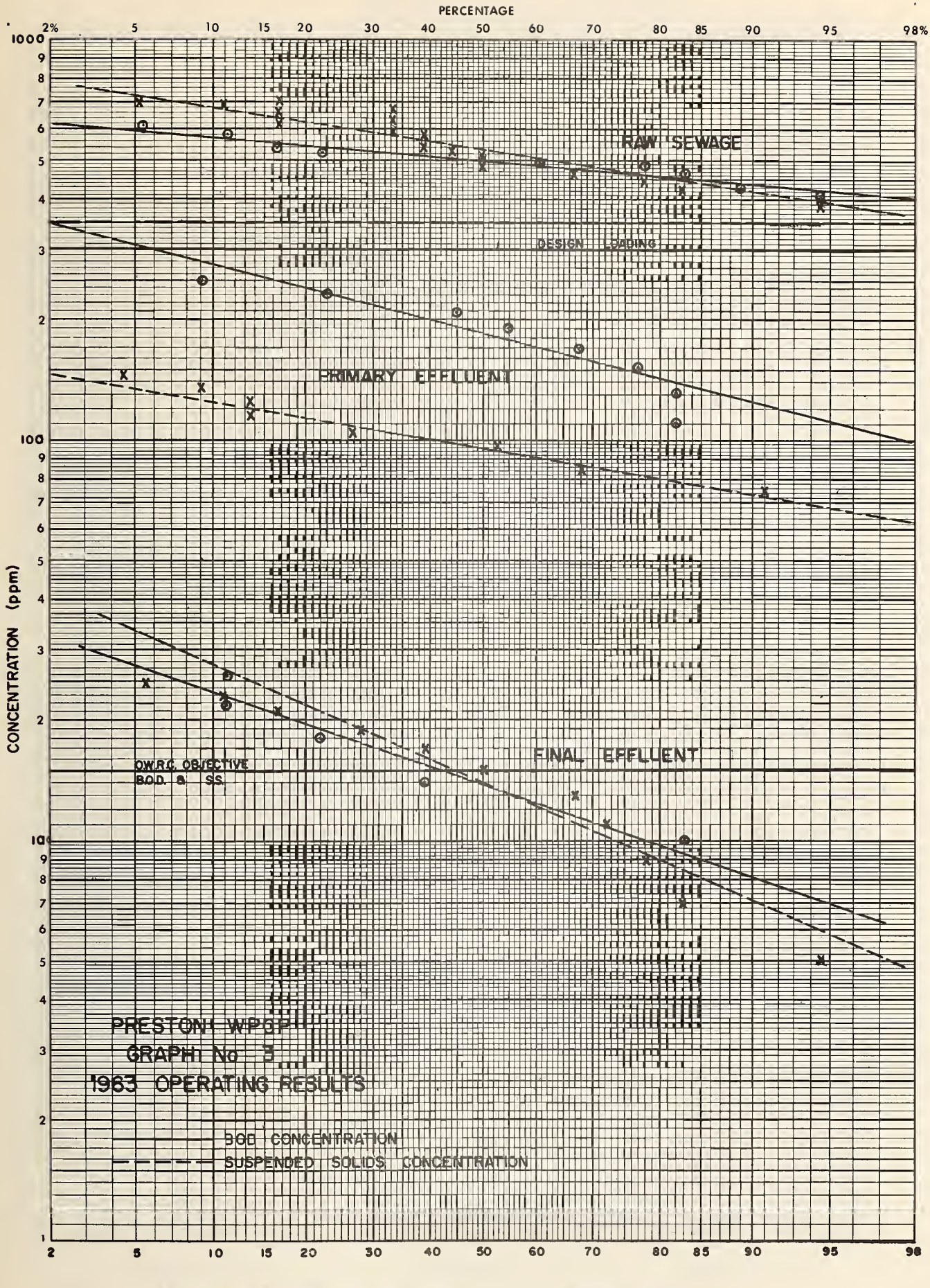
a) The average BOD and suspended solids concentration of the raw sewage exceeded the design figure of 300 PPM most of the time.

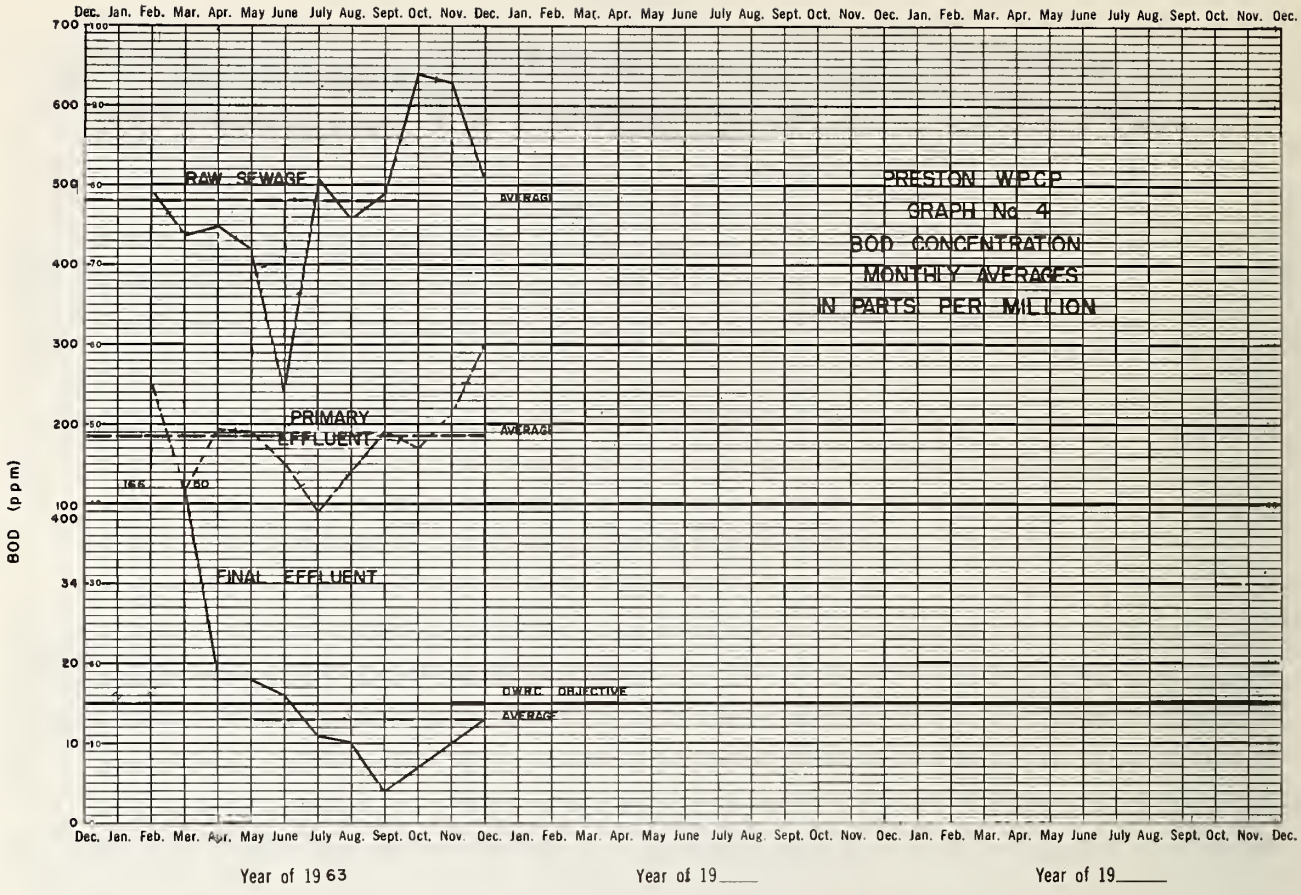
b) The reduction of suspended solids through primary treatment is much greater than the reduction of BOD.

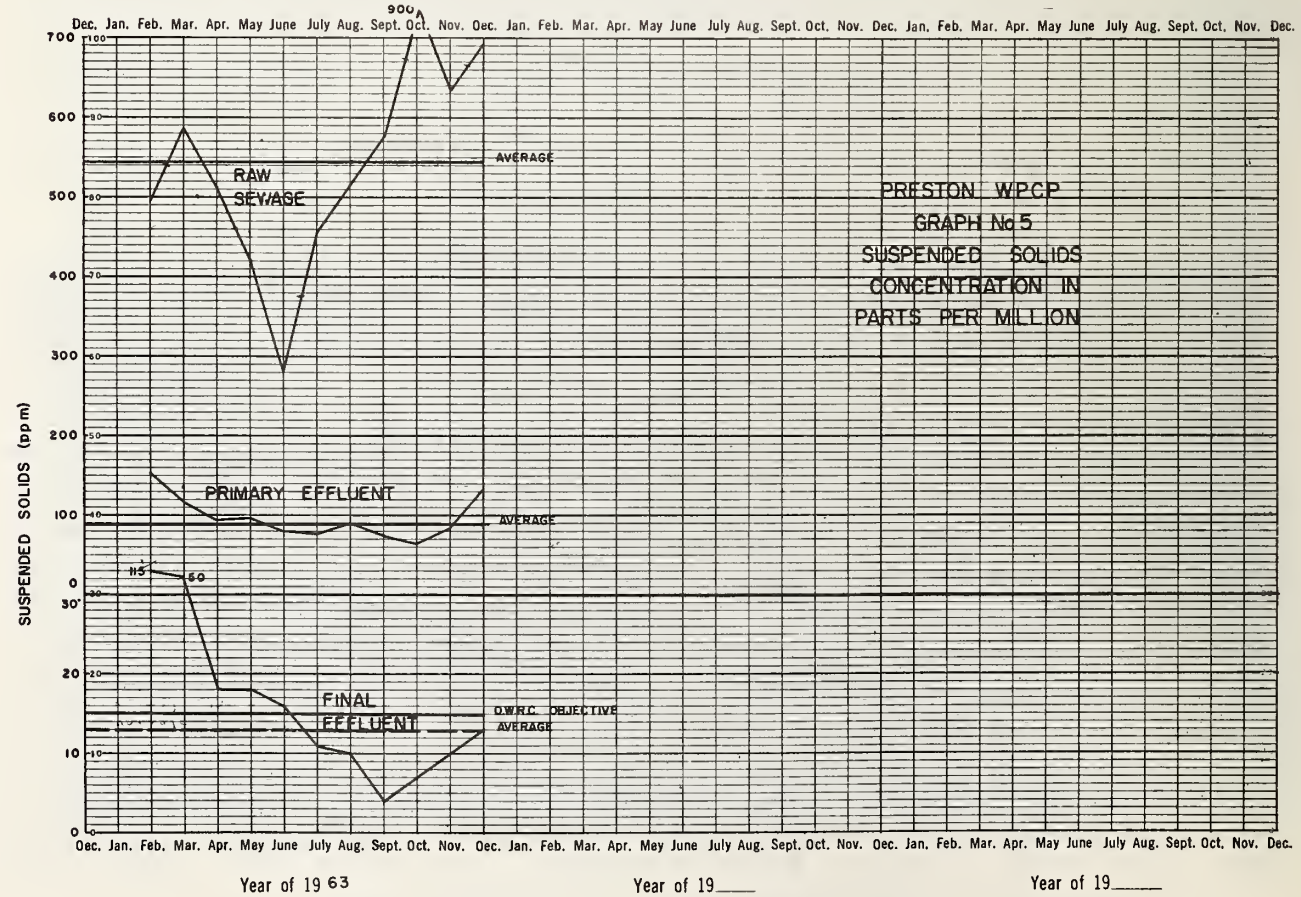
c) The criteria of 15 PPM for BOD and suspended solids of final effluent was exceeded about 45% of the time.




Dec. Jan. Feb. Mar. Apr. May June July Aug. Sept. Oct. Nov. Dec. Jan. Feb. Mar. Apr. May June July Aug. Sept. Oct. Nov. Dec. Jan. Feb. Mar. Apr. May June July Aug. Sept. Oct. Nov. Dec.
1·0
0·9
0·8
0·7
0·6
0·5
100
90
80
70
60
50
40
30
20
10
0
DAILY FLOW (MGD)
AVERAGE
PRESTON W.P.C.P.
GRAPH No 2
AVERAGE DAILY FLOW
FOR MONTH IN MILLIONS OF
GALLONS PER DAY
NOTE: DESIGN FLOW 1.8 M.G.D.
Dec. Jan. Feb. Mar. Apr. May June July Aug. Sept. Oct. Nov. Dec. Jan. Feb. Mar. Apr. May June July Aug. Sept. Oct. Nov. Dec.
Year of 19 63
Year of 19____
Year of 19____


PERCENTAGE
2%
5
10
15
20
30
40
50
60
70
80
85
90
95
98%
1000
100
10
1
RAW SEWAGE
DESIGN LOADING
PRIMARY EFFLUENT
FINAL EFFLUENT
O.W.R.C. OBJECTIVE
B.O.D. & S.S.
CONCENTRATION (ppm)
PRESTON WPCP
GRAPH No 3
1963 OPERATING RESULTS
BOD CONCENTRATION
SUSPENDED SOLIDS CONCENTRATION
PER CENT OF CONCENTRATION EQUAL TO OR GREATER THAN


Dec. Jan. Feb. Mar. Apr. May June July Aug. Sept. Oct. Nov. Dec. Jan. Feb. Mar. Apr. May June July Aug. Sept. Oct. Nov. Dec. Jan. Feb. Mar. Apr. May June July Aug. Sept. Oct. Nov. Dec.
BOD (p p m)
700
600
500
400
300
200
100
0
RAW SEWAGE
AVERAGE
PRIMARY EFFLUENT
AVERAGE
165
150
FINAL EFFLUENT
D.W.R.C. OBJECTIVE
AVERAGE
PRESTON WPCP
GRAPH No. 4
BOD CONCENTRATION
MONTHLY AVERAGES
IN PARTS PER MILLION
Year of 1963
Year of 19____
Year of 19____


900
Dec. Jan. Feb. Mar. Apr. May June July Aug. Sept. Oct. Nov. Dec. Jan. Feb. Mar. Apr. May June July Aug. Sept. Oct. Nov. Dec. Jan. Feb. Mar. Apr. May June July Aug. Sept. Oct. Nov. Dec.
SUSPENDED SOLIDS (p p m)
700
600
500
400
300
200
100
0
AVERAGE
RAW SEWAGE
PRIMARY EFFLUENT
AVERAGE
115
50
FINAL EFFLUENT
D.W.R.C. OBJECTIVE
AVERAGE
PRESTON WPCP
GRAPH No. 5
SUSPENDED SOLIDS
CONCENTRATION IN
PARTS PER MILLION
Year of 1963
Year of 19____
Year of 19____

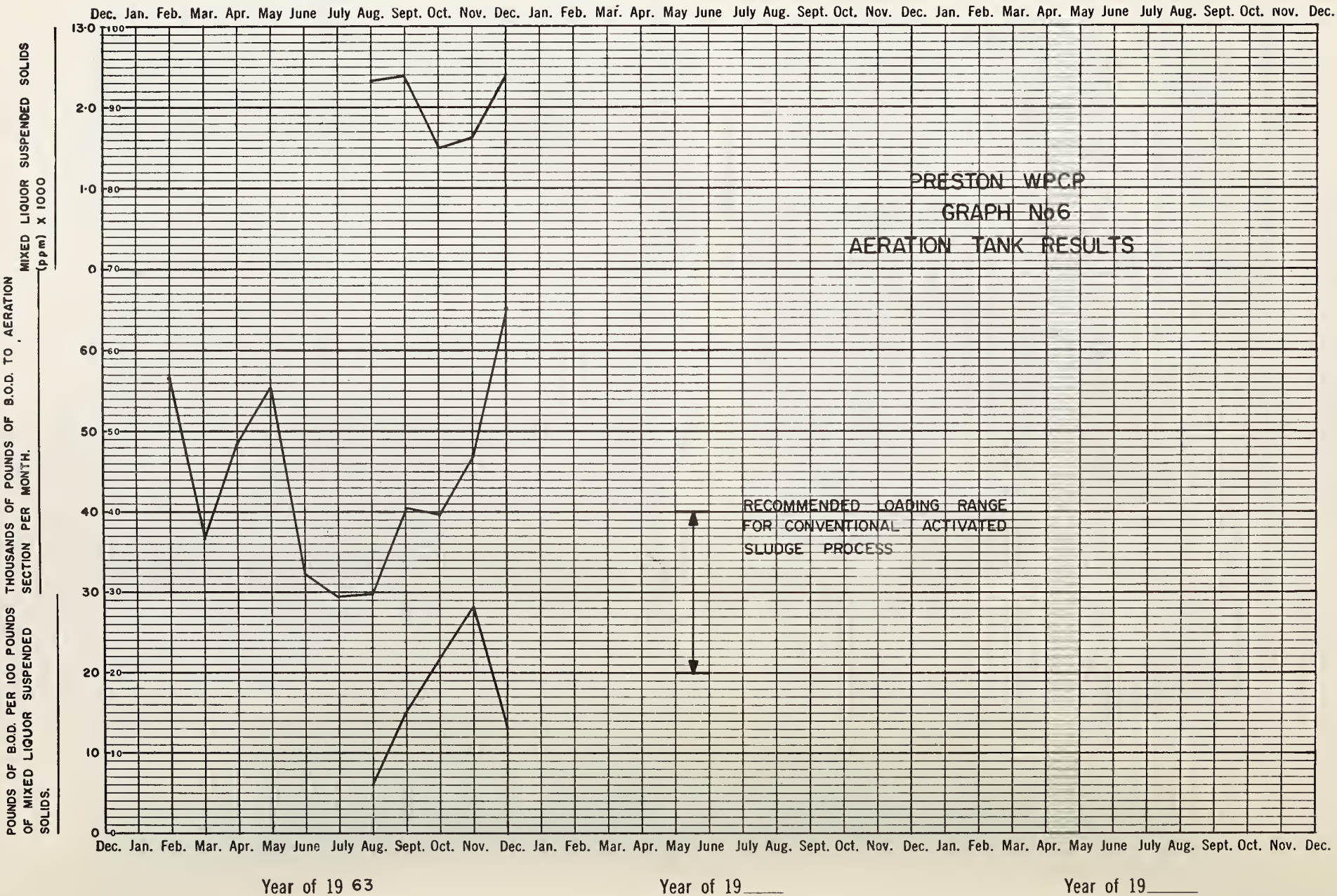
GRIT, B.O.D AND S.S. REMOVAL

MONTH	B. O. D.				S. S.				GRIT REMOVAL CU. FT.
	INFLUENT P.P.M.	EFFLUENT P.P.M.	% REDUCTION	TONS REMOVED	INFLUENT P.P.M.	EFFLUENT P.P.M.	% REDUCTION	TONS REMOVED	
JAN.	-	-	-	-	-	-	-	-	-
FEB.	495	188	62.0	34.461	497	166	66.5	37.155	-
MAR.	438	52	88.0	60.004	584	50	91.5	83.010	
APR.	447	14	97.0	54.147	512	18	96.5	61.775	
MAY	420	10	97.5	59.614	421	18	95.5	58.596	
JUNE	240	7.6	96.5	24.995	282	16	94.5	28.608	
JULY	505	12	97.5	55.108	458	11	97.5	49.930	
AUG.	460	14	97.0	47.629	518	10	98.0	54.249	2
SEPT.	490	12	97.5	50.764	573	4	99.5	60.827	
OCT.	640	6.4	99.0	73.570	900	7	99.0	103.690	3
NOV.	630	16	97.5	67.070	632	10	98.5	67.944	
DEC.	510	11	98.0	53.286	691	13	98.0	72.400	
TOTAL				580.648				678.184	5
AVG.	480	31	93.0	52.786	551	27	94.1	61.653	.46

COMMENTS

The average percent reduction at 93 and 94.1 for BOD and SS, is considered to be effective treatment.

The average BOD and SS concentration of 480 and 551 ppm respectively is considered very high and the effective reduction can only be attributed to good operation. It should be noted that the plant efficiency was low during February and March, due to the start up of the plant. The effluent and plant efficiency was excellent for the remainder of the year.


Dec. Jan. Feb. Mar. Apr. May June July Aug. Sept. Oct. Nov. Dec. Jan. Feb. Mar. Apr. May June July Aug. Sept. Oct. Nov. Dec. Jan. Feb. Mar. Apr. May June July Aug. Sept. Oct. Nov. Dec.
POUNDS OF B.O.D. PER 100 POUNDS OF MIXED LIQUOR SUSPENDED SOLIDS.
THOUSANDS OF POUNDS OF B.O.D. TO AERATION SECTION PER MONTH.
MIXED LIQUOR SUSPENDED SOLIDS (ppm) X 1000
13·0
2·0
1·0
0
60
50
40
30
20
10
0
100
90
80
70
60
50
40
30
20
10
0
PRESTON WPCP
GRAPH No6
AERATION TANK RESULTS
RECOMMENDED LOADING RANGE FOR CONVENTIONAL ACTIVATED SLUDGE PROCESS
Dec. Jan. Feb. Mar. Apr. May June July Aug. Sept. Oct. Nov. Dec. Jan. Feb. Mar. Apr. May June July Aug. Sept. Oct. Nov. Dec. Jan. Feb. Mar. Apr. May June July Aug. Sept. Oct. Nov. Dec.

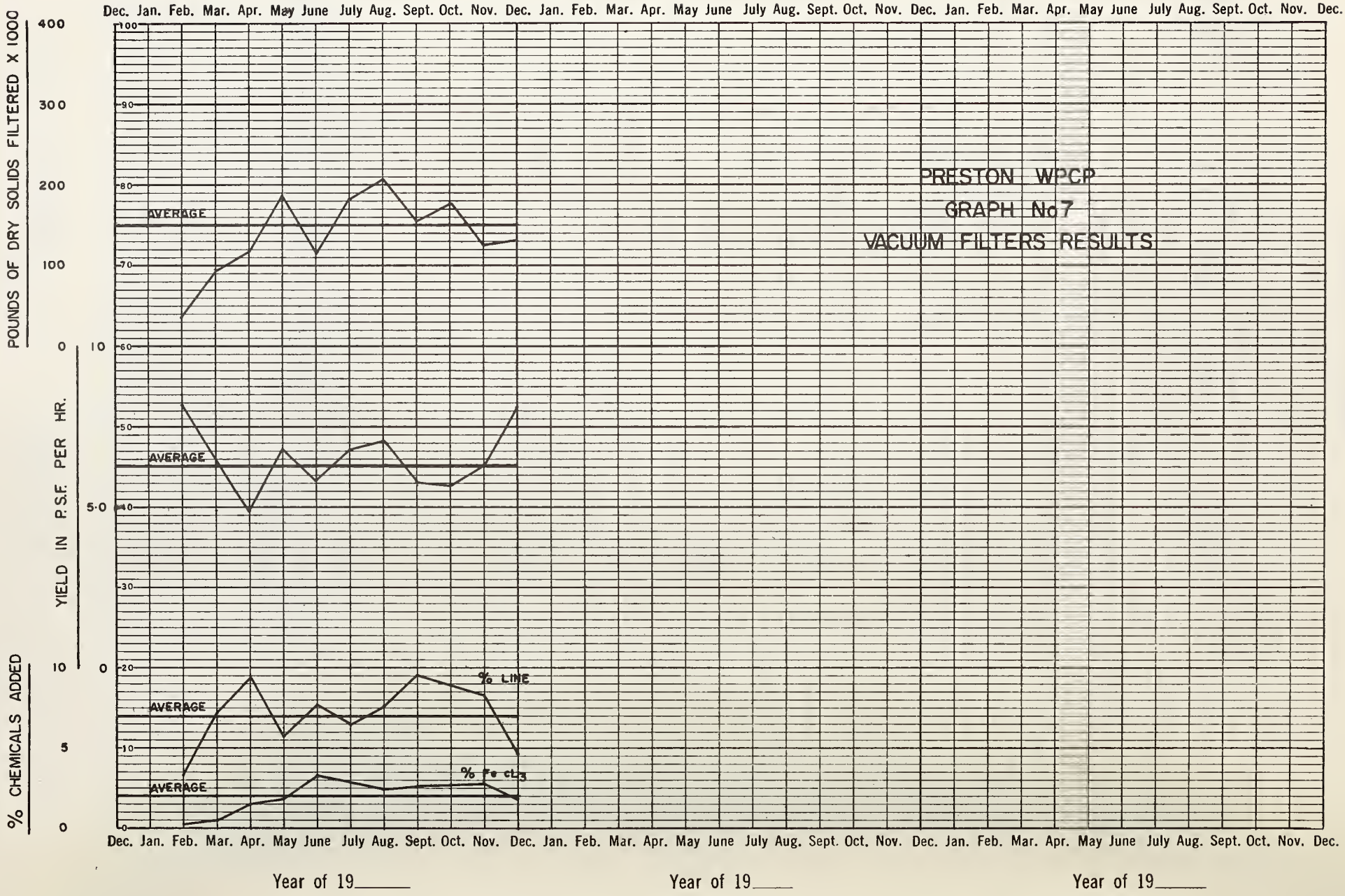
Year of 19 63 Year of 19____ Year of 19____

AERATION SECTION

MONTH	PRIM. EFFL B.O.D. P.P.M.	M.L.S.S. P.P.M.	LBS. BOD. PER 100 LBS. M. L. S. S.	CUBIC FEET AIR PER LB. B.O.D. REMOVED
JANUARY	–			
FEBRUARY	252			
MARCH	118			
APRIL	193			
MAY	190			
JUNE	150			
JULY				
AUGUST	140	2301	6	
SEPTEMBER	190	2394	15	
OCTOBER	170	1502	22	
NOVEMBER	215	1627	28	
DECEMBER	305	2401	13	
TOTAL				
AVERAGE	204	2045	17	

COMMENTS

Aeration section data prior to August 1963 are not available, and thus are not shown above. The secondary section of this plant performed very satisfactorily throughout the year. Optimum BOD loading for the conventional activated sludge process varies between 20 to 40 pounds of BOD per 100 pounds of mixed liquor suspended solids.


Dec. Jan. Feb. Mar. Apr. May June July Aug. Sept. Oct. Nov. Dec. Jan. Feb. Mar. Apr. May June July Aug. Sept. Oct. Nov. Dec. Jan. Feb. Mar. Apr. May June July Aug. Sept. Oct. Nov. Dec.
POUNDS OF DRY SOLIDS FILTERED X 1000
400
300
200
100
0
YIELD IN P.S.F. PER HR.
10
5·0
0
% CHEMICALS ADDED
10
5
0
AVERAGE
AVERAGE
% LIME
AVERAGE
% Fe cl3
PRESTON WPCP
GRAPH No 7
VACUUM FILTERS RESULTS
Year of 19____
Year of 19____
Year of 19____

VACUUM FILTER OPERATION

MONTH	FILTER HOURS		% SOLIDS DIGEST SLUDGE	LBS. DRY SOLIDS FILTERED	LBS. LIME	% LIME	LBS. $FeCl_3$	% $FeCl_3$	% SOLIDS FILTERED SLUDGE	YIELD PSF/HOUR
	#1	#2								
JAN.										
FEB.	28.0		9.0	35,685	1900	3.4	87	.20	28.0	8.2
MAR.	60.6		7.9	96,577	8200	7.2	399	.42	27.0	6.5
APR.	98.6		9.2	119,834	13800	9.5	1809	1.5	23.0	4.9
MAY.	110.6		8.4	187,076	13900	5.7	3489	1.9	25.4	6.8
JUNE	80.1		7.1	113,893	11300	7.6	3702	3.3	22.0	5.8
JULY	106.4		7.7	180,661	15550	6.5	5258	2.9	22.0	6.8
AUG.	116.6		7.8	208,452	20250	7.2	4992	2.4	23.0	7.1
SEPT.	109.0		6.8	156,381	19550	9.5	4126	2.7	21.0	5.8
OCT.	126.0		6.6	178,657	21000	8.9	5045	2.8	22.0	5.7
NOV.	83.7		7.3	126,832	13400	8.2	3440	2.8	23.0	6.3
DEC.	63.8		9.0	130,194	7950	4.6	2275	1.8	28.0	8.2
TOTAL	983.4			1534,242	146800		34622			
AVG.	89.4		7.9	139,477	13345	7.1	3147	2.1	24.0	6.5

COMMENTS

Filtered sludge is hauled from the plant by truck.

CHLORINATION

MONTH	PLANT FLOW (MG)	POUNDS CHLORINE	DOSAGE RATE (PPM)
JANUARY	.762	-	-
FEBRUARY	.803	-	-
MARCH	1.003	-	-
APRIL	.834	-	-
MAY	.938	-	-
JUNE	.717	-	-
JULY	.721	-	-
AUGUST	.689	-	-
SEPTEMBER	.708	46.6	6.58
OCTOBER	.749	50.8	6.78
NOVEMBER	.729	50.8	6.96
DECEMBER	.689	46.8	6.79
TOTAL		195.0	
AVERAGE	.779	48.7	6.78

COMMENTS

An average dosage of 6.78 ppm chlorine was required in 1963 to give a residual of 0.5 ppm free chlorine.

1963

PLANT — **Total Operating Costs** — **MONTHLY**

MONTH	TOTAL EXPENDITURE	PAYROLL	CASUAL PAYROLL	FUEL	POWER	CHEMICAL	GENERAL SUPPLIES	EQUIPMENT	REPAIRS & MAINTENANCE	SUNDRY	WATER
JAN	371	362								9	
FEB	997	916					31			49	
MARCH	6900	916			261	5419	54		49	111	59
APRIL	2053	916		143	305	240	236			198	-
MAY	2227	916			384	219	90	92		316	210
JUNE	1772	916			135		125	75	133	301	-
JULY	2397	1391			256	234	79			206	231
AUG	3212	980	62	-	269	1380	94	180		247	
SEPT	2956	1142	254	-	279	462	73	12	18	428	277
OCT	2461	1038	296		289	231	233		121	239	
NOV	2445	984	239	-	284	-	121	-	45	272	464
DEC	2859	1476	163	120	327	231	57	119	-	301	-
TOTAL	30651	11953	1015	263	2789	8417	1192	478	366	2677	1240

PLANT — **YEARLY**

YEAR	MG TREATED	TOTAL COST	COST MG	COST PER CAP. PER YEAR.	COST 1B/BOD REMOVED
1963	284.127	$30,651	$108.00	$2.00	$54.50

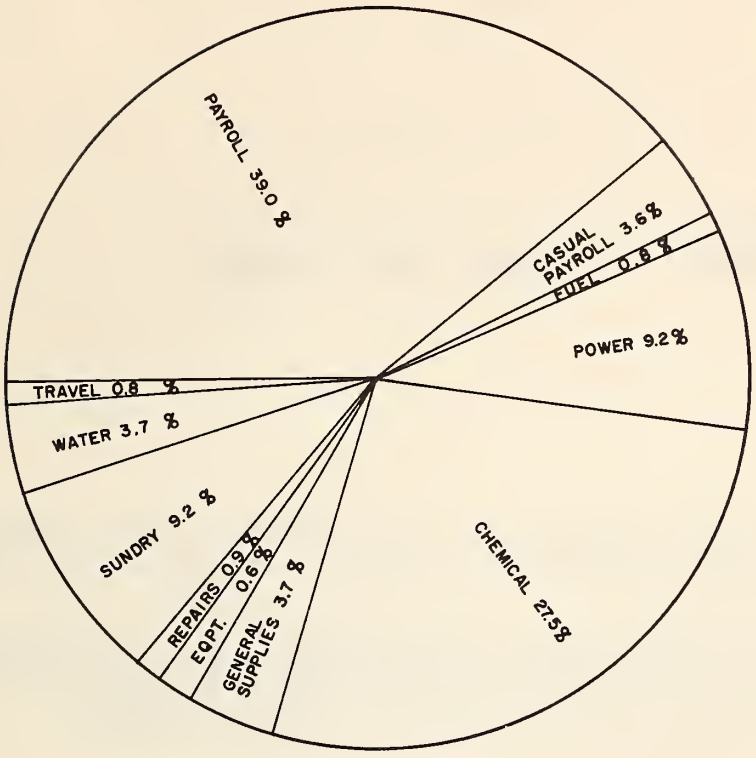
VACUUM FILTER COSTS MONTHLY

MONTH	COST PER MONTH					ACCUMULATIVE TOTAL	COST PER TON DRY WEIGHT					ACCUMULATIVE TOTAL
	$FeCl_3$	LIME	LABOUR	ELEC	MAINT		$FeCl_3$	LIME	LABOUR	ELEC	MAINT	
JANUARY												
FEBRUARY	6	22	56	40	5	129	.34	1.23	3.14	2.24	.28	7.23
MARCH	26	95	121	40	5	287	.53	1.97	2.50	.83	.11	5.94
APRIL	118	160	197	40	5	520	1.97	2.67	3.29	.67	.08	8.68
MAY	227	161	221	40	5	654	2.42	1.72	2.36	.43	.05	6.98
JUNE	241	131	160	40	5	577	4.24	2.30	2.81	.70	.09	10.14
JULY	342	180	213	40	5	780	3.79	1.99	2.36	.44	.06	8.64
AUGUST	324	234	233	40	5	836	3.11	2.25	2.24	.38	.05	8.03
SEPTEMBER	268	226	218	40	5	757	3.43	2.90	2.87	.51	.06	9.77
OCTOBER	328	241	252	40	5	866	3.67	2.70	2.82	.45	.07	9.71
NOVEMBER	224	155	167	40	5	591	3.54	2.37	2.64	.63	.08	9.26
DECEMBER	148	92	128	40	5	413	2.27	1.41	1.97	.61	.08	6.34
TOTAL	2252	1697	1966	440	55	6410	29.31	23.51	29.00	7.89	1.01	90.72
AVERAGE PER MONTH	204	154	179	40	5	582	2.66	2.14	2.64	.72	.09	8.25

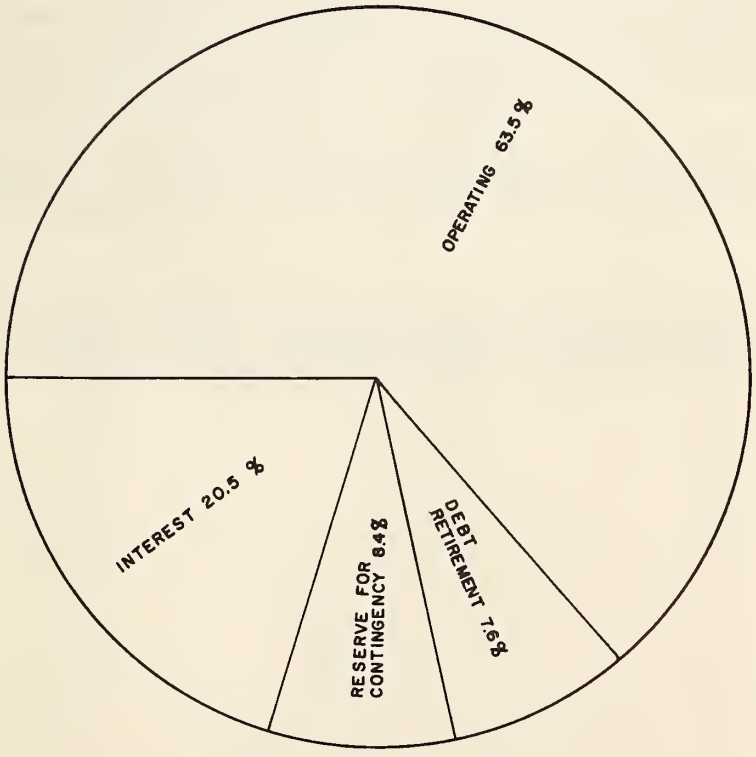
COMMENTS

The average cost per ton of dry solids filtered was $8.25 during 1963.

SUMMARY OF COSTS
PRESTON WPCP



OPERATING COSTS



TOTAL COST

SUMMARY

This report has given in detail significant data on the operation of the various treatment units of the Preston Sewage Treatment Plant.

The average daily flow of 0.779 million gallons is well below the design flow of 1.8 million gallons. Although no trend can be predicted from the available figures, it is expected that the flow will increase, due to the general growth of the municipality.

The average BOD for the last nine months of the year was acceptable by Ontario Water Resources Commission standards. The operation for the first three months was not as good, due to start up problems. This is to be expected with new plants.

The BOD and Suspended Solids of the influent is much higher than was expected in the design of the plant. However, the sewage is of such quality that it is easily treated, and particularly applicable to vacuum filtration as indicated by the low cost of chemicals and the high solids content associated with the vacuum filter operation.

Operating costs for the year have been kept quite low, due to good filter operation and low maintenance and repair costs. It is expected that costs will increase as more repairs will be required in the future.

The plant staff has maintained a clean, attractive and efficient plant for the Town of Preston, special attention is given to good public relations and every year many visitors tour the facilities.

Total 1963 Costs

The total cost to the municipality during 1963 was as follows:

Operating Cost	$30,650.61
Debt Retirement	$ 3,651.00
Reserve	$ 3,893.00
Interest	$ 9,941.39
TOTAL	$48,136.00

Note: The amount in the Reserve for contingencies account as of December 31st, 1963 was $3,931.33.

Division of Plant Operations

ONTARIO WATER RESOURCES COMMISSION
801 BAY ST. TORONTO 5